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EVALUATION OF FIXED MOMENTARY DRO SCHEDULES UNDER SIGNALED AND UNSIGNALED ARRANGEMENTS

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Fixed momentary schedules of differential reinforcement of other behavior (FM DRO) generally have been ineffective as treatment for problem behavior. Because most early research on FM DRO included presentation of a signal at the end of the DRO interval, it is unclear whether the limited effects of FM DRO were due to (a) the momentary response requirement of the schedule per se or (b) discrimination of the contingency made more salient by the signal. To separate these two potential influences, we compared the effects of signaled versus unsignaled FM DRO with 4 individuals with developmental disabilities whose problem behavior was maintained by social-positive reinforcement. During signaled FM DRO, the experimenter presented a visual stimulus 3 s prior to the end of the DRO interval and delivered reinforcement contingent on the absence of problem behavior at the second the interval elapsed. Unsignaled DRO was identical except that interval termination was not signaled. Results indicated that signaled FM DRO was effective in decreasing 2 subjects' problem behavior, whereas an unsignaled schedule was required for the remaining 2 subjects. These results suggest that the response requirement per se of FM DRO may not be problematic if it is not easily discriminated.

Key words: differential reinforcement of other behavior, functional analysis, reinforcement schedules

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Differential reinforcement of other behavior (DRO) schedules are used frequently to treat a wide range of problem behaviors (Lennox, Miltenberger, Spengler, & Erfanian, 1988; Vollmer & Iwata, 1992). DRO typically involves delivery of reinforcement contingent on the absence of a response for a specified period of time. Aside from this common feature, a number of procedural variations have been reported in the literature, along with some disparate findings.

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The most common variation of DRO is interval DRO, in which the reinforcer is delivered at the end of an interval during which the target behavior did not occur. Both fixed-interval (FI) and variable-interval (VI) DRO schedules have been used extensively and have shown to be extremely effective in reducing problem behavior (Lindberg, Iwata, Kahng, & DeLeon, 1999; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). Several limitations of interval DRO have been noted, however, including low rates of reinforcement (Vollmer et al., 1993) and extinction-induced side effects (Cowdery, Iwata, & Pace, 1990). Moreover, because accurate implementation of interval DRO requires continuous monitoring of behavior, it may prove to be difficult for caregivers to implement with a high degree of accuracy.

Momentary DRO may represent a convenient alternative to interval DRO (Barton, Brulle, & Repp, 1986; Derwas & Jones, 1993; Kahng, Abt, & Schonbachler, 2001; Lindberg et al., 1999). The criterion for reinforcement under a momentary DRO contingency is the absence of a target response only at the precise second the interval times out. Because this contingency does not require the complete cessation of problem behavior throughout the interval, momentary DRO may (a) circumvent some of the limitations of interval DRO and (b) share many of the advantages of noncontingent reinforcement (NCR; Vollmer et al., 1993) but reduce the likelihood of adventitious reinforcement that may result from the use of NCR (Vollmer, Ringdahl, Roane, & Marcus, 1999).

Previous research on momentary DRO has produced mostly negative or mixed results. Some researchers found momentary DRO to be ineffective in reducing problem behavior (Harris & Wolchik, 1979), whereas others reported that momentary DRO might be effective when used as a maintenance procedure (Barton et al., 1986; Repp, Barton, & Brulle, 1983), when paired with other procedures such as punishment (Sisson, Van Hasselt, Hersen, & Aurand, 1988), or when implemented on a dense schedule (Derwas & Jones, 1993). More recently, research has indicated that momentary-like contingencies may be effective when functional reinforcers are delivered under schedules that reduce the potential for adventitious reinforcement. For example, Vollmer et al. (1997) and Britton, Carr, Kellum, Dozier, and Weil (2000) showed that tandem fixed-time (FT) plus 10-s DRO schedules may effectively decrease problem behavior maintained by social-positive reinforcement. However, because the tandem schedules evaluated in these studies included a brief interval DRO contingency, they did not represent true momentary DRO arrangements.

One momentary DRO arrangement that has received particular attention is the variable momentary (VM) schedule, whose inconsistent nature renders the critical moment at which responding must be absent less discriminable (Kahng et al., 2001; Lindberg et al., 1999). For example, Lindberg et al. compared two parametric features of DRO, schedule regularity (fixed vs. variable) and the omission contingency (interval vs. momentary) to determine whether VM DRO would yield effects comparable to those achieved under FI and VI DRO schedules. Results showed that FI, VI, and VM DRO schedules were equally effective in decreasing three subjects' self-injurious behavior (SIB) maintained by social-positive reinforcement. The authors excluded one variation, fixed momentary (FM) DRO, from their study because most previous research in which momentary DRO was found to be relatively ineffective involved the use of fixed schedules. Thus, Lindberg et al. speculated that regularity of the FM DRO schedule might be readily discriminated by subjects, thereby rendering it an ineffective procedure.

Several characteristics of early research on momentary DRO, however, may have contributed to the lack of effects found. First, reinforcers typically delivered were not necessarily those that maintained and competed with problem behavior (Harris & Wolchik, 1979; Repp et al., 1983; Sisson et al., 1988). Second, initial interval lengths often were selected arbitrarily, and in some cases, the contingencies were described to the subjects (Conyers, Miltenberger, Romaniuk, Kopp, & Himle, 2003; Repp et al., 1983). Finally, and most relevant to the present study, the delivery of reinforcement usually was preceded by the presentation of a signal, such as prompts or praise (Harris & Wolchik, 1979), gestures (Repp et al., 1983), or auditory cues including music (Sisson et al., 1988) or tones (Conyers et al., 2003). Harris and Wolchik, for example, compared the effects of momentary DRO, time-out, and overcorrection in reducing self-stimulatory behavior exhibited by four boys

Table 1
Summary of Previous Research on Momentary DRO Schedules

Study	Schedule	S^{r+}	Signal	Effective?
Harris and Wolchik (1979)	fixed	arbitrary?	turning away; prompts or praise	no
Repp et al. (1983)	fixed	arbitrary?	gesture	no before FI DRO yes after FI DRO
Barton et al. (1986)	fixed	arbitrary?	tone	yes after FI DRO
Sisson et al. (1988)	variable	arbitrary?	music	no
Derwas and Jones (1993)	fixed	arbitrary?	none	yes
Miller and Jones (1997)	?	arbitrary?	?	yes
Lindberg et al. (1999)	variable	functional	none	yes
Kahng et al. (2001)	variable	functional	tone	yes
Conyers et al. (2003)	variable	arbitrary?	tone	no

Note. Studies are listed in the far left column, followed by the type of schedule used, whether functional reinforcers were delivered, whether reinforcer delivery was signaled, and whether treatment was effective.

with autism. During the DRO condition, the experimenter either turned away from the subject to record data (Studies 1 and 2) or delivered prompts or praise (Study 3) prior to the delivery of reinforcement, either of which may have facilitated discrimination of the momentary requirement of the DRO schedule by signaling the end of the interval. Repp et al. compared the effects of interval and momentary DRO on the disruptive behavior of four children in a classroom setting. During all treatment conditions, the experimenter sat at the front of the classroom and raised her hand as the DRO interval clocked out. In the interval DRO condition, subjects were told that they would earn an edible item when the experimenter raised her hand if they did not engage in any disruptive behavior throughout the 5-min interval. In the momentary DRO condition, subjects were told that they would earn an edible item if they were not engaging in disruptive behavior when the 5-min interval elapsed. Thus, the explicit instructions, as well as the raised hand, may have facilitated discrimination of the contingency in effect.

Table 1 summarizes previous research on momentary DRO. Some commonalities among studies in which momentary DRO was found to be effective include the fact that functional reinforcers were delivered and impending reinforcer delivery was not signaled. These results suggest that the lack of effect often reported with FM DRO may not have been due to the fixed nature of the schedule per se but the fact that the contingency was easily discriminated. If so, it is possible that FM DRO may be effective when functional reinforcers are delivered under unsignaled arrangements, and the purpose of this study was to systematically examine the effects of signaling procedures in FM DRO schedules.

METHOD

Subjects and Setting

Four individuals who attended a school for children with special needs participated. All subjects had been referred for assessment and treatment of problem behavior and were selected for inclusion in this study based on results of their functional analyses. Seth was a 6-year-old boy identified as deaf and learning impaired whose problem behavior was aggression. Alex was a 14-year-old boy with autism and seizure disorder who engaged in aggression. Curtis was a 13-year-old boy with autism; his problem behavior also was aggression. Abby was a 19-year-old woman with profound mental retardation, autism, and seizure disorder. She engaged in SIB in the form of head hitting.

Sessions were conducted in an unused classroom at the school, which contained a

table, chairs, and materials that varied according to the conditions in effect (see below). Sessions were 10 min in duration; one to four sessions were conducted each day, and sessions typically were conducted 3 to 5 days per week depending on the subjects' schedules.

Response Measurement and Reliability

The primary dependent measures were the number of responses per minute of problem behavior and the percentage of programmed reinforcers earned by the subjects during each DRO condition. Topographies of problem behavior included aggression (Seth, Alex, and Curtis) and head hitting (Abby). *Aggression* included hitting, kicking, biting, and head butting (Seth, Alex, and Curtis), as well as throwing objects within 6 in. of a person (Seth) and scratching (Curtis). *Head hitting* was defined as audible hand-to-head contact.

Data also were collected on several experimenter behaviors. *Attention delivery* was defined as the experimenter initiating verbal or physical interaction with the subject. A *prompt* was defined as the first (verbal) instruction in a three-step instructional sequence. *Escape* was defined as the experimenter terminating demands and turning away from the subject for 30 s. *Tangible delivery* was defined as the experimenter handing the subject an item or placing an item directly within reach of the subject. *Signal display* was defined as the experimenter holding the programmed reinforcer above her head (so as to be visible to the subject) for 3 s.

Observers used Palm PDAs to record occurrences of problem behavior and experimenter behavior. Data on problem behavior were converted to rate measures (responses per minute). Data on experimenter behavior were calculated by dividing the number of behaviors recorded (e.g., reinforcer delivery) by the number of minutes in a session. From these data, the proportion of available (programmed) reinforcers earned by the subject was calculated by dividing the number of reinforcers delivered within a session by the total number of reinforcers programmed by the schedule in effect.

A second observer simultaneously but independently recorded data during a mean of 39% of the functional analysis sessions and 38% of treatment sessions for all subjects. Interobserver agreement was calculated by dividing session time into consecutive 10-s intervals, dividing the smaller number of responses by the larger number of responses in each interval that did not include zero responses, averaging those values across the session, and multiplying by 100%. Mean agreement on problem behavior during functional analysis sessions was 97% (range, 91% to 100%), 99.7% (range, 98% to 100%), 99% (range, 92% to 100%), and 97% (range, 87% to 100%) for Seth, Alex, Curtis, and Abby, respectively. Mean agreement on problem behavior during treatment conditions was 94% (range, 83% to 100%), 97% (range, 88% to 100%), 96% (range, 84% to 100%), and 94% (range, 81% to 100%) for Seth, Alex, Curtis, and Abby, respectively. Mean agreement on reinforcer delivery and signal display during treatment sessions was 97% (range, 77% to 100%) and 98% (range, 75% to 100%) across all subjects.

Phase 1: Functional Analysis

Procedure

Functional analysis procedures were similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Test and control conditions were alternated in a multielement design. An ignore condition was not conducted if the target response was aggression. Specific stimuli (i.e., different experimenters, setting, and colored shirts) were associated with each condition to enhance discrimination of conditions.

During the ignore condition, the subject was in a quiet area of the room without access to leisure items or social interaction. The experimenter was present but did not deliver any consequences for problem behavior or its

absence. The purpose of this condition was to determine if problem behavior persisted in the absence of social contingencies, suggesting that it was maintained by nonsocial (automatic) reinforcement. During the attention condition, the subject was seated at a table with two moderately preferred items within reach. The experimenter directed the subject to play with the items and then proceeded to do some work. Contingent on the occurrence of problem behavior, the experimenter delivered a brief (3 to 5 s) verbal reprimand, a statement of concern, and physical contact (e.g., hand on the shoulder or response blocking in the case of SIB). The purpose of this condition was to determine if problem behavior was maintained by social-positive reinforcement in the form of attention. During the demand condition, the subject was seated at a table containing task materials. The experimenter presented academic or vocational tasks on an FT 30-s schedule using a graduated, three-step prompting procedure (verbal instruction, model prompt, and physical guidance at 5-s intervals if compliance did not occur). Contingent on compliance, the experimenter delivered verbal praise and began a new trial. Contingent on problem behavior, the experimenter removed the materials and turned away from the subject for 30 s. The purpose of this condition was to determine if problem behavior was maintained by social-negative reinforcement in the form of escape from task demands. During the play condition, the subject and experimenter were seated at a table or on the floor. The subject had continuous access to three highly preferred items that had been identified via a paired-stimulus preference assessment (Fisher et al., 1992) prior to the start of the functional analysis. The experimenter initiated friendly interaction with the subject approximately every 30 s (contingent on a 5-s absence of problem behavior). This condition served as the common control for the other conditions. Finally, during the tangible condition, the subject was seated at a table and was given approximately 90-s free access to highly preferred leisure or edible items immediately prior to session onset. The experimenter removed the items at the start of session and, contingent on the occurrence of problem behavior, delivered 30-s access to the leisure items (Seth, Alex, and Curtis) or one small edible item (Abby). The purpose of this condition was to determine whether problem behavior was maintained by social-positive reinforcement in the form of access to preferred items.

Results

Figure 1 shows results of each subject's functional analysis. Seth's aggression was maintained by multiple sources of social reinforcement, including access to attention, escape from demands, and preferred items (toys), as evidenced by high rates of problem behavior in each of these conditions relative to the play condition. For the purpose of this study, only the tangible function was targeted (attention and escape functions were treated separately). Alex engaged in aggression only during the tangible condition, and both Curtis and Abby engaged in problem behavior almost exclusively in the tangible condition. Thus, data for all subjects indicated that their problem behavior was maintained at least in part by social-positive reinforcement, which was a prerequisite for participation in the treatment phases of the study.

Phase 2: Analysis of Signaled and Unsignaled FM DRO

Baseline

Baseline consisted of the tangible condition from the functional analysis. Reinforcers included a toy box (containing various highly preferred items) for Seth, videotapes (viewed on the television) for Alex and Curtis, and an edible item for Abby.

FM DRO Contingencies

Two variations of FM DRO were evaluated: signaled and unsignaled. Both schedules shared

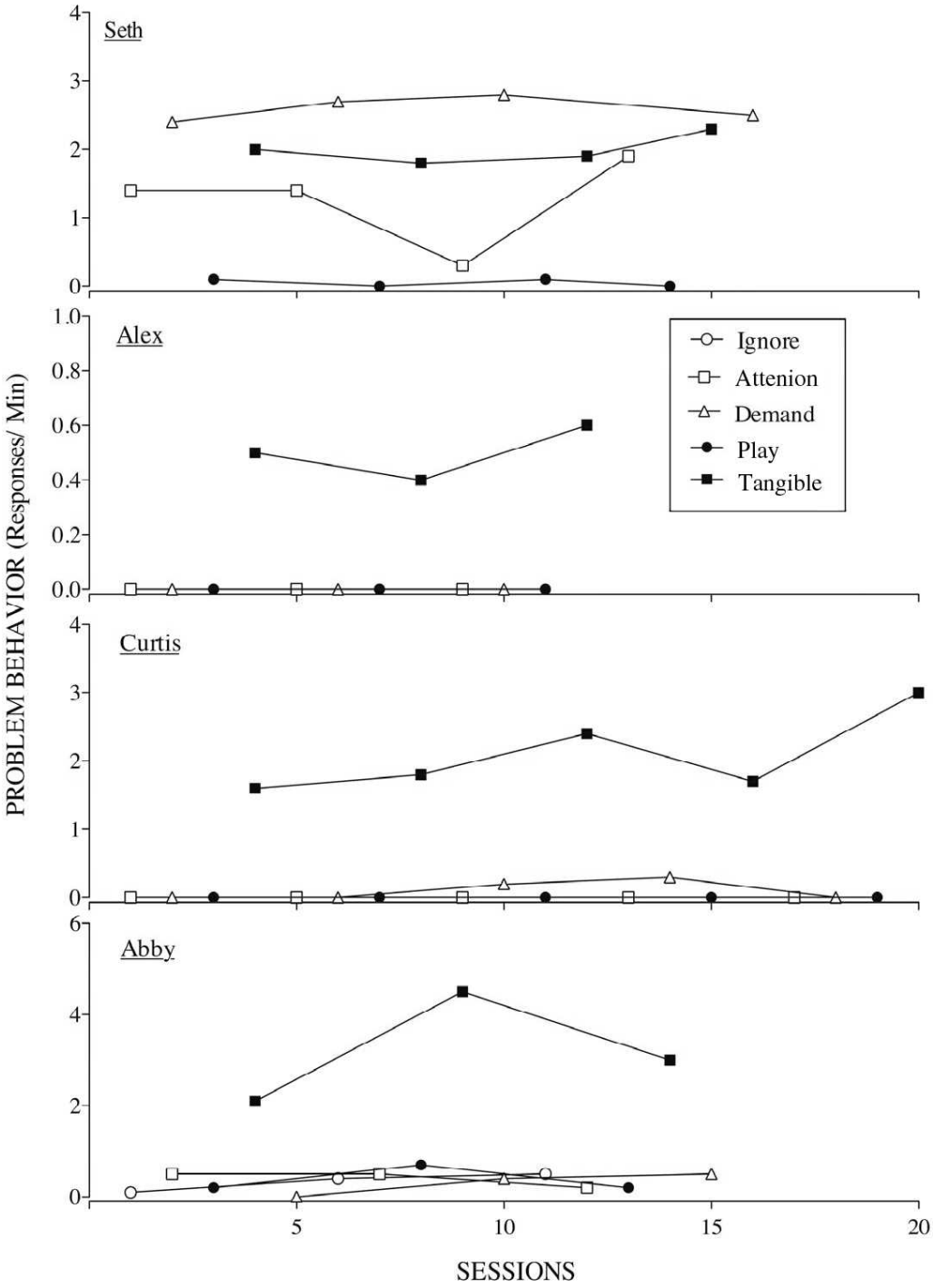

Figure 1. Responses per minute of problem behavior during functional analysis conditions.

the following features. All sessions for each subject were conducted in the same location by the same experimenter. The experimenter did not describe the contingencies at any time prior to or during the session, used a handheld silent timer to monitor the passage of time, and delivered the reinforcer (used in baseline) contingent on the absence of problem behavior at the precise second the interval clocked out. Initial DRO values were based on mean interresponse times (IRTs) observed during the last three baseline sessions. Subsequent values increased by 50% (rounded to the nearest 5 s) following two consecutive sessions with problem behavior at or below an 80% reduction from mean baseline rates. The terminal goal was to establish a 5-min DRO interval while maintaining low rates of problem behavior.

Signaled FM DRO. The experimenter covertly held the reinforcer to ensure that it could be delivered quickly but that no additional movements (e.g., reaching for the reinforcer) might inadvertently signal the end of an interval. Three seconds prior to the end of an interval, the experimenter (positioned directly in front of or next to the subject) signaled impending reinforcement delivery by holding the reinforcer above her head. If no problem behavior was occurring at the precise second the interval clocked out, the reinforcer (30-s access to the toy box or video, or one edible item) was delivered. If problem behavior was occurring at that second, the signal was removed, and the reinforcer was withheld until the next scheduled interval.

Unsignaled FM DRO. This condition was similar to the signaled condition, except that the experimenter did not signal impending reinforcer delivery. Rather, the experimenter quickly delivered the reinforcer contingent on the absence of problem behavior when the interval ended.

Design

Reversal designs were used to examine the effects of signaled and unsignaled FM DRO schedules. Given that the main purpose of this study was to evaluate the effects of signaling procedures on FM DRO schedules, signaled DRO always was implemented first to eliminate the potential influence of prior exposure to unsignaled DRO. If signaled DRO proved to be ineffective, unsignaled DRO then was implemented.

Results

Figure 2 shows Seth's and Alex's results. Both subjects exhibited moderate rates of aggression during the initial baseline. Signaled FM DRO initially was implemented under 20-s and 30-s intervals for Alex and Seth, respectively, and was associated with rapid reductions in aggression. Following a return to baseline, during which both subjects' aggression increased, signaled DRO was reinstated and again was associated with rapid reductions in aggression. Seth's and Alex's aggression generally remained low as the DRO interval was thinned, eventually reaching the terminal criterion of 300 s (5 min). Across all DRO conditions, both subjects earned a large proportion of reinforcers, indicating that they typically did not engage in aggression when the DRO interval ended. Their low overall rates of aggression, however, indicate that they also refrained from aggression throughout the DRO interval and not just at its conclusion.

Figure 3 shows results obtained for Curtis and Abby. Curtis's rate of aggression was moderate across all baseline phases. When signaled FM DRO was implemented initially (with a 20-s interval), his aggression increased substantially during the first several sessions and, because aggression often occurred when the interval elapsed, he seldom received reinforcement. Eventually, however, his aggression decreased to near zero in the first signaled DRO condition. When signaled FM DRO was implemented a second time, however, his aggression did not decrease and remained variable across many sessions. Therefore, unsignaled FM DRO was implemented. Aggression decreased to zero

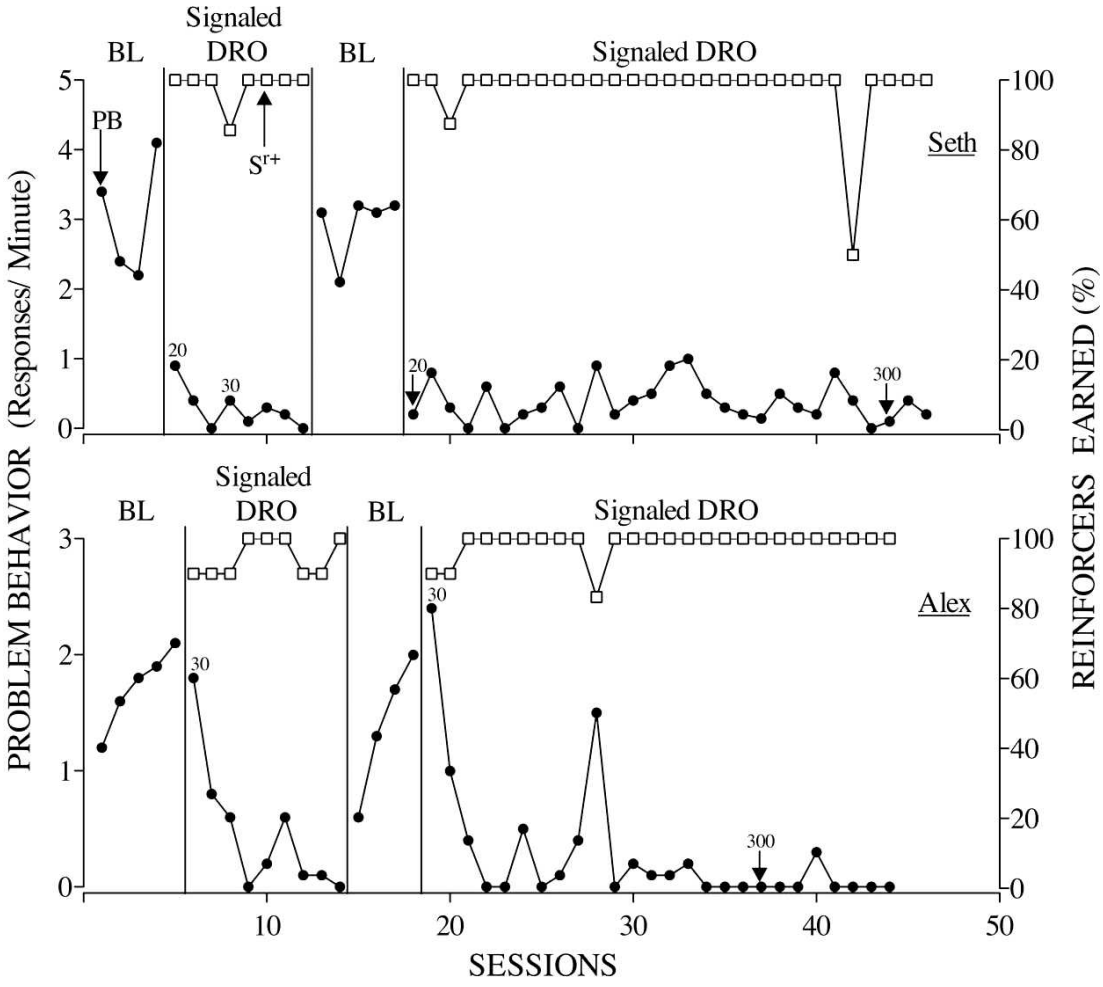

Figure 2. Responses per minute of problem behavior (PB) during baseline (BL) and signaled DRO conditions, and percentage of available reinforcers (S^{r+}) earned during DRO conditions for Seth and Alex. Numbers above the data path for problem behavior indicate DRO interval lengths (in seconds) that were in effect during the first and final sessions of each phase.

following five sessions in the unsignaled DRO condition, and he earned a large proportion of available reinforcers. Low rates of aggression and high levels of reinforcement were observed during two subsequent unsignaled DRO conditions, although reductions in aggression were gradual in both conditions. The DRO interval was increased to 300 s during his third unsignaled DRO condition. During the last 10 sessions of this condition, he engaged in near-zero rates of aggression, and he earned all available reinforcers.

Abby's head hitting was variable and showed an increasing trend during her initial baseline. A further increase in head hitting was observed under signaled DRO. Despite this increase, she earned a large proportion of available reinforcers during signaled DRO, suggesting that her head hitting was under discriminative control of the signal (i.e., head hitting ceased when the signal was presented). Following a return to baseline, during which Abby's head hitting continued to occur at variable rates, unsignaled DRO was implemented, beginning with a 10-s

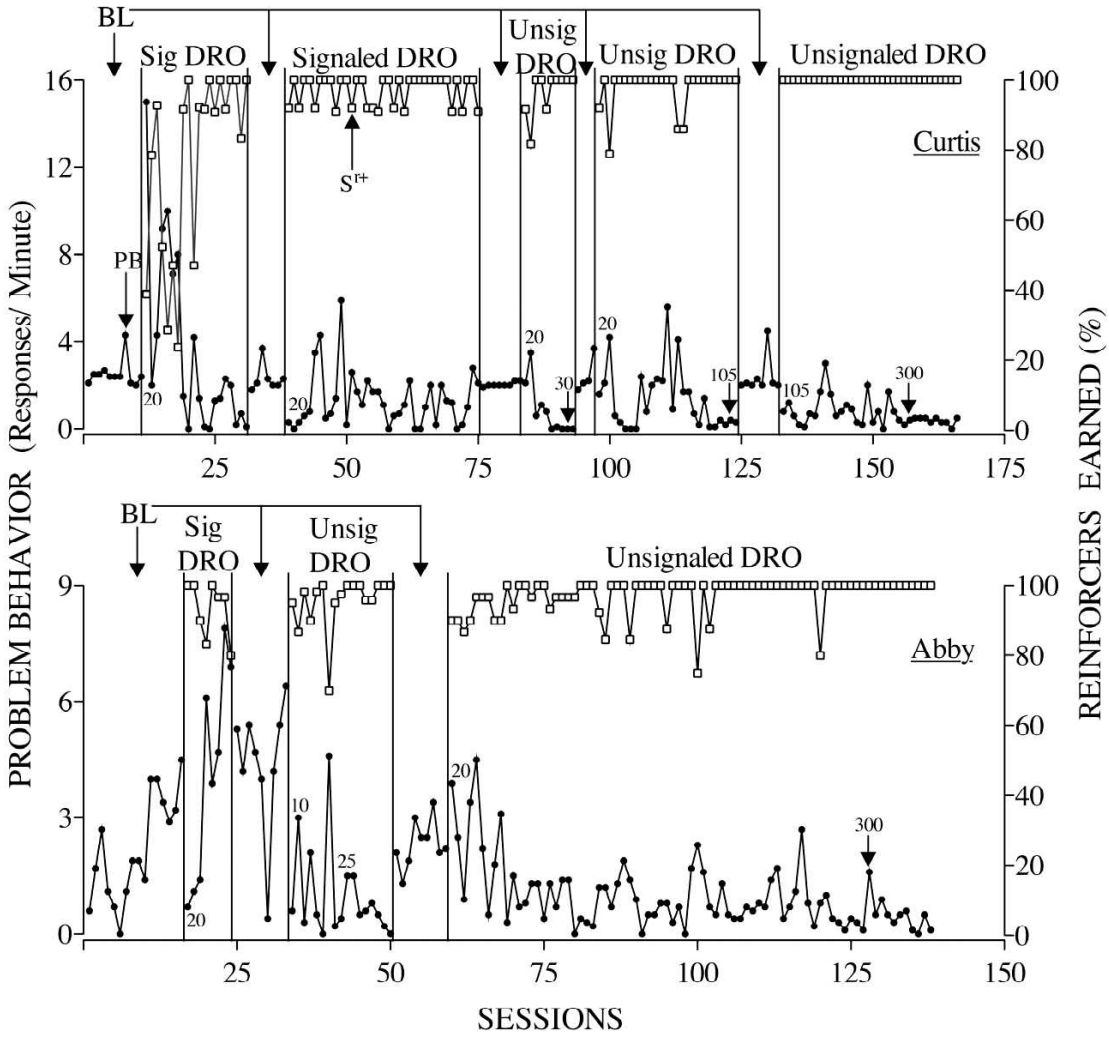

Figure 3. Responses per minute of problem behavior (PB) during baseline (BL) and signaled DRO conditions, and percentage of available reinforcers (S^{r+}) earned during DRO conditions for Curtis and Abby. Numbers above the data path for problem behavior indicate DRO interval lengths (in seconds) that were in effect during the first and final sessions of each phase.

interval. Although variable rates of head hitting were observed during the first 10 sessions of the unsignaled DRO condition, head hitting eventually decreased to near zero, and she earned a large proportion of available reinforcers. Moderate rates of head hitting again were observed during the third baseline. Lower, although variable, rates of head hitting again were observed during the second and final unsignaled DRO phase, and a large proportion of available reinforcers was earned. Abby's mean rate of head hitting was 0.4 responses per minute during the last 10 unsignaled FM DRO sessions, and she earned all available reinforcers.

DISCUSSION

Results of this study showed that FM DRO can be an effective treatment for problem behavior, but that signals correlated with interval termination may have detrimental effects because they facilitate discrimination of

the momentary nature of the contingency. Although signaled FM DRO produced rapid reductions in the problem behavior of two subjects (Seth and Alex), it had negligible effects on the other two subjects (Curtis and Abby).

The general results of this study were consistent with those of recent research (Kahng et al., 2001; Lindberg et al., 1999) showing that momentary DRO may be effective when functional reinforcers are incorporated into the contingency. This feature may be one determinant of the effectiveness of momentary DRO. An obvious difference between these studies and previous research in which momentary DRO was found to be ineffective (Conyers et al., 2003; Harris & Wolchik, 1979; Repp et al., 1983; Sisson et al., 1988) was the inclusion of reinforcers that maintained problem behavior.

Results of this study indicate, however, that the inclusion of functional reinforcers may not be sufficient to reduce problem behavior under momentary DRO schedules because another determinant of their effectiveness may be the discriminability of the schedule.[1] Lindberg et al. (1999) used VM DRO schedules, which are somewhat unpredictable due to their irregularity. By contrast, the FM DRO schedules used in this study were highly predictable, and we facilitated discrimination by signaling the end of the DRO interval. Nevertheless, the problem behavior of two subjects (Seth and Alex) decreased under the signaled FM DRO condition. These subjects apparently failed to discriminate the actual requirement of the contingency, such that the liberal reinforcement and extinction components of FM DRO decreased their behavior in a manner similar to what would have been observed under other types of DRO schedules.

Curtis and Abby, on the other hand, failed to show reductions in problem behavior under signaled FM DRO although they earned a large proportion of available reinforcers. Thus, it appears that they discriminated the momentary nature of the contingency and responded accordingly. This was especially true for Abby, whose problem behavior actually increased under signaled FM DRO. Cumulative records of her problem behavior during three signaled FM DRO sessions (Figure 4) indicated that responding occurred at variable rates throughout most DRO intervals but reliably ceased when the signal was delivered, thereby allowing her to meet the criterion for reinforcement. When the termination of intervals was made less discriminable by eliminating the signals, reliable decreases were observed in both subjects' problem behavior.

These results have some bearing on the practicality of implementing various DRO schedules. A common criticism of interval DRO is that it necessitates continuous monitoring of the client behavior by caregivers. Thus, although interval DRO is a highly effective procedure, it may not be very practical, and thinning the DRO schedule does not improve practicality because continuous observation is still required. Results of this study indicate that FM DRO, which is less stringent than interval DRO, can reduce problem behavior maintained by social-positive reinforcement. These results are consistent with those of previous studies in which reductions in problem behavior were observed when differential reinforcement was implemented with less-than-perfect consistency (Vollmer, Roane, Ringdahl, & Marcus, 1999; Worsdell, Iwata, Hanley, Thompson, & Kahng, 2000). It remains to be shown, however, whether momentary DRO is easier to implement than interval DRO or whether momentary DRO is likely to be implemented more consistently.

Related to the above, one limitation of this study is that we did not conduct a comparison of FM DRO and FI DRO. Because our main interest was the influence of signals on the

[1] Schedule predictability is a problem only with momentary DRO. Interval schedules (FI DRO and VI DRO) are not affected because, regardless of the predictability of the schedule, the requirement for reinforcement is complete absence of responding throughout the interval.

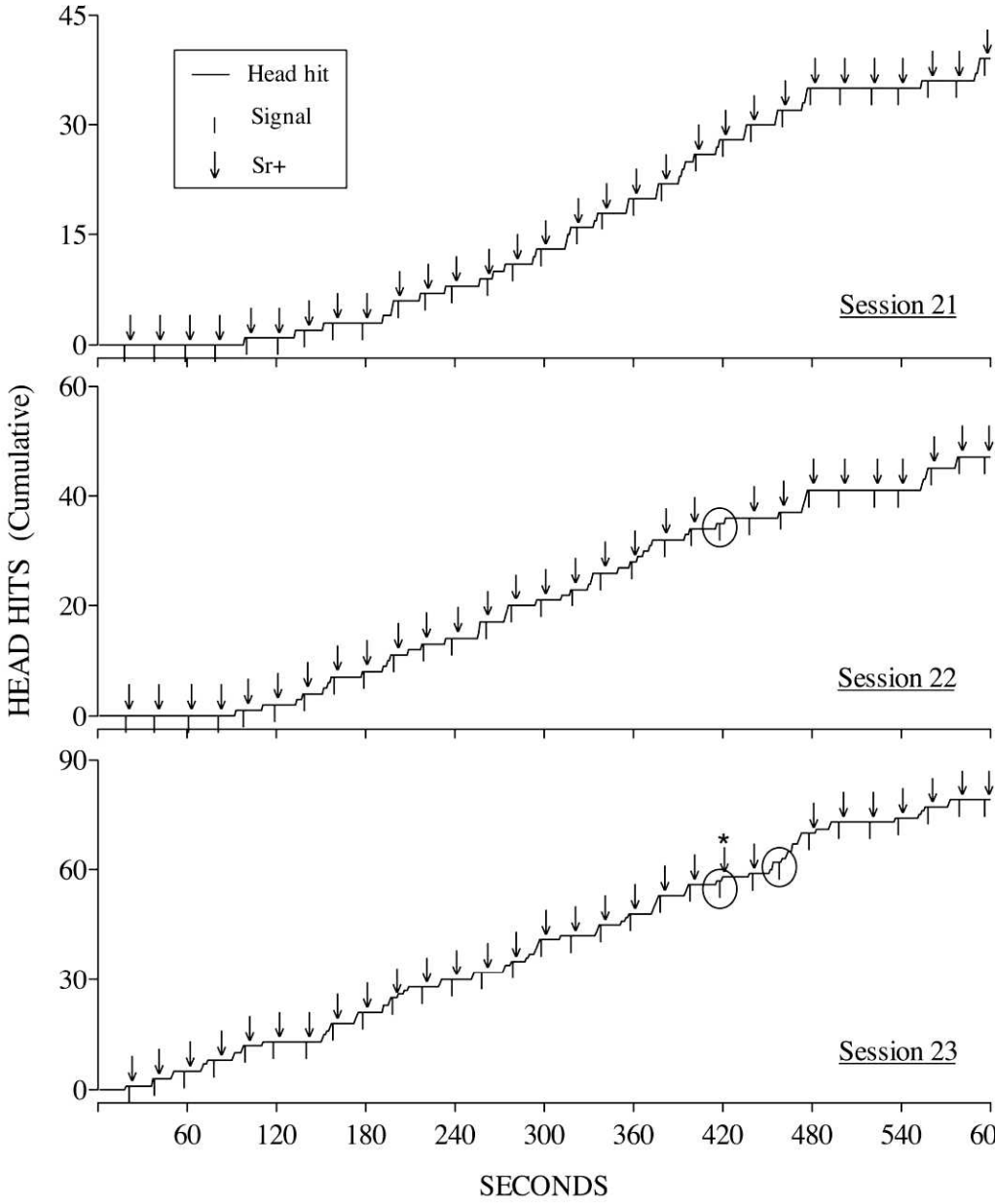

Figure 4. Cumulative number of head hits during three sessions of the signaled DRO condition for Abby. Vertical lines indicate delivery of the signal, arrows indicate reinforcer delivery, and open circles indicate instances in which problem behavior occurred after the signal. The asterisk above Second 420 in Session 23 indicates that reinforcement was delivered when it should not have been.

effects of FM DRO schedules, and because previous research (Lindberg et al., 1999) already has shown that momentary DRO may be as effective as interval DRO, we did not find it necessary to conduct such a comparison. However, future research may evaluate whether (a) more rapid effects are obtained under momentary versus interval DRO schedules, (b) FM DRO is associated with higher rates of obtained reinforcement, and (c) caregivers

implement momentary DRO with greater accuracy than interval DRO. For example, should interval DRO produce greater response suppression than momentary DRO but caregivers demonstrate greater accuracy with the momentary DRO, an analysis could be conducted to determine the relative costs and benefits of each schedule.

A second limitation of this study is that our analysis included only problem behavior maintained by social-positive reinforcement. Because previous studies on momentary DRO (e.g., Kahng et al., 2001; Lindberg et al., 1999) and its variants (Borrero, Vollmer, & Wright, 2002; Britton et al., 2000; Vollmer et al., 1997) also focused on problem behavior maintained by social-positive reinforcement, it remains unknown whether similar effects can be achieved with problem behavior maintained by social-negative or automatic reinforcement.

A third limitation of this study is that we did not replicate the negative findings associated with signaled DRO for Curtis and Abby. It is possible that reductions in problem behavior could have been achieved had signaled DRO been implemented a third (Curtis) or second (Abby) time around. However, given the elevated and sustained rates of problem behavior shown by both subjects in this condition, replicating the ineffectiveness of signaled DRO did not seem warranted.

Finally, it should be noted that Curtis and Abby required a number of sessions to achieve the terminal criterion under unsignaled momentary DRO. Perhaps more rapid effects could have been achieved had interval DRO first been used. Previous research has suggested that momentary DRO may be more effective when preceded by interval DRO (Barton et al., 1986; Repp et al., 1983), and future research could evaluate this possibility further. For example, it is possible that more rapid treatment effects could be obtained with momentary DRO implemented in the natural environment when it is first preceded by interval DRO implemented by skilled therapists in a clinic setting.

In summary, this study demonstrated that FM DRO schedules may be effective in reducing problem behavior maintained by social-positive reinforcement, particularly when interval termination is not readily discriminated. These results provide further evidence of the beneficial effects of momentary DRO schedules and suggest that FM DRO, in particular, may be a viable treatment for caregivers to implement in natural settings. That aside, however, these data indicate that momentary DRO should be used with caution, because very subtle therapist responses (e.g., reaching for the programmed reinforcer) may function as signals that could render FM DRO ineffective.

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